

**CLAIMS**

1. A dry mate connector, comprising:
  - 2 a first module having a forward end and a rear end;
  - a second module having a forward end and a rear end;
  - 4 a coupling member mounted on the first module for releasably securing the modules together in a mated position;
  - 6 the modules and coupling member being relatively movable in a single axial mating motion between an unmated position and a mated, locked
  - 8 position and being movable relative to one another in a single axial unmating motion opposite to the mating motion to release the modules from one
  - 10 another;
  - the coupling member and mated modules together forming a closed,
  - 12 locked and sealed chamber; and
  - the first and second modules each having at least one forwardly facing
  - 14 contact for communication with the contact of the other module within the chamber in the mated position.
2. The connector as claimed in claim 1, wherein sealing means are
  - 2 provided between the coupling member and modules in the mated position for sealing opposite ends of the chamber, the sealing means forming a seal
  - 4 that can support a pressure differential.
3. The connector as claimed in claim 1, wherein the coupling member
  - 2 comprises a sleeve projecting forwardly from the forward end of the first module for receiving the forward end of the second module in the mated
  - 4 position, the chamber being defined within the sleeve.
4. The connector as claimed in claim 2, wherein sealing means are
  - 2 provided between the coupling sleeve and each module in the mated position for sealing opposite ends of the chamber, the sealing means comprising at

4     least one seal member between the coupling sleeve and first module and at  
least one seal member between the coupling sleeve and second module.

5.     The connector as claimed in claim 4, wherein the sealing means  
2     comprises two seal members between the coupling sleeve and each module.

6.     The connector as claimed in claim 5, wherein the seal members  
2     comprise O-ring seals.

7.     The connector as claimed in claim 4, wherein the seal members each  
2     form a pressure seal that can support a pressure differential.

8.     The connector as claimed in claim 1, wherein the modules have  
2     interengageable snap lock formations for releasably securing the modules  
together in the mated position.

9.     The connector as claimed in claim 8, wherein the coupling member  
2     holds the interengageable formations of the modules in locking engagement  
in the mated position.

10.    The connector as claimed in claim 1, wherein the coupling member  
2     movable relative to the first module between a first locking position when the  
modules are unmated and a second locking position when the modules are  
4     mated, the coupling member and first module having opposing inner and  
outer surfaces, respectively, one of said surfaces having a locking detent and  
6     the other of said surfaces having first and second spaced locking members  
for releasable locking engagement in the locking detent in the first and  
8     second locking positions, respectively.

11.    The connector as claimed in claim 10, wherein the first locking member  
2     comprises a seal member for sealing engagement between said coupling

4 member and first module when not engaged in said locking detent, said first  
locking member forming a seal at one end of said chamber in the mated  
position.

12. The connector as claimed in claim 10, wherein first, second and third  
2 seal members are provided for sealing engagement between the coupling  
member and first module, the first seal member comprising said first locking  
4 member for engagement in said detent in the first locking position, and said  
second seal member comprising said second locking member engaging in  
6 said locking detent in the second locking position, whereby the first and third  
seal members provide a double seal at one end of the chamber in the mated  
8 position.

13. The connector as claimed in claim 12, wherein said seal members  
2 comprise O-ring seals.

14. The connector as claimed in claim 10, wherein the coupling member  
2 comprises a sleeve and spaced first, second, and third seal members are  
provided for sealing engagement between the coupling sleeve and first  
4 module, the first seal member comprising said first locking member engaging  
in said locking detent in the first locking position of said coupling sleeve and  
6 the second seal member comprising said second locking member engaging in  
said locking detent in the second locking position of said coupling sleeve,  
8 whereby the first and third seal members comprise two spaced seal members  
between the first module and coupling sleeve in the second locking position.

15. The connector as claimed in claim 14, wherein said locking detent is  
2 located on the inner surface of said coupling sleeve and said seal members  
comprise spaced O-ring seals mounted on said first module.

16. The connector as claimed in claim 1, wherein the first module has  
2 a plurality of resilient locking tines extending forwardly from its forward end,  
the tines having enlarged end portions, and the second module has an outer  
4 surface having an annular locking indent for releasable snap engagement  
with the enlarged end portions of the tines when the modules are moved into  
6 mating engagement.

17. The connector as claimed in claim 16, wherein said coupling member  
2 comprises a sleeve projecting forwardly from the first module for receiving the  
forward end of the second module during mating, the sleeve being movable  
4 relative to the first module during mating between a first, unmated position  
and a second, mated position, the sleeve having a detent for alignment with  
6 said enlarged end portions when said coupling sleeve is in said first locking  
position, whereby said tines can flex over said second module when said  
8 second module is pushed into said coupling sleeve, and said detent is moved  
away from said tines in said second mated position, whereby the inner  
10 surface of said coupling sleeve holds said enlarged end portions of said tines  
in said annular locking indent on the second module when said modules are  
12 in mating engagement.

18. The connector as claimed in claim 1, wherein the contacts are  
2 electrical contacts.

19. The connector as claimed in claim 1, wherein the contacts are optical  
2 contacts.

20. A connector as claimed in claim 19, wherein a first ferrule is mounted  
2 in the first module and a second ferrule is mounted in the second module,  
each ferrule having a forward end face for face-to-face engagement with the  
4 forward end face of the other ferrule in the mated condition, the optical  
contacts being located at the forward end faces of the respective ferrules.

6 21. The connector as claimed in claim 20, wherein a first, single fiber  
optical cable is secured to the rear end of the first module and a second,  
8 single fiber optical cable is secured to the rear end of the second module, a  
single optical fiber in the first cable extending through the first module and  
10 first ferrule up to said forward end face, the first fiber having a forward end  
comprising the first optical contact, a single optical fiber in the second cable  
12 extending through the second module and second ferrule up to said forward  
end face, the second fiber having a forward end comprising the second  
14 optical contact, whereby said connector comprises an in-line cable-to-cable  
connector.

22. The connector as claimed in claim 19, wherein one of said modules  
2 includes means for securing the unit in a bulkhead and a cable is secured to  
the rear end of the other unit, whereby said connector comprises a bulkhead  
4 feedthrough connector.

23. The connector as claimed in claim 1, wherein the coupling member  
2 and second module each have a single outer gripping surface for gripping by  
a user when moving the modules in both the mating and unmating motions.

24. The connector as claimed in claim 1, wherein the first module has a  
2 plurality of first contacts seated therein and the second module has a plurality  
of second contacts seated therein equal in number to the number of first  
4 contacts, each first contact being in signal communication with a  
corresponding second contact in the mated position.

25. A connector, comprising:  
2 a first module;  
a second module;

4 a coupling sleeve slidably mounted on the first module for releasably  
securing the modules together in a mated position, the coupling sleeve having  
6 a forward end, a rear end, and a first through bore;  
each module having a forward end and a rear end, the forward end of  
8 the coupling sleeve being spaced forwardly from the forward end of the first  
module and slidably receiving the forward end of the second module in the  
10 mated position;  
a first contact seated in the first module;  
12 a second contact seated in the second module;  
the first contact being connected with the second contact in the mated  
14 position;  
the modules each having outer surface portions located within the  
16 coupling sleeve in the mated position;  
at least one seal member between the outer surface portion of each of  
18 the modules and the coupling sleeve through bore in the mated position to  
define a sealed chamber in the coupling sleeve between the seal members in  
20 which the contacts are located, whereby the chamber has a seal at each end  
to protect the contacts from the surrounding harsh environment when the  
22 connector is deployed; and  
whereby relative movement between the modules in a single, first  
24 direction mates, locks and seals the modules in the mated position and  
relative movement in a single, second direction opposite to the first direction  
26 unlocks and releases the modules to allow them to be separated, the  
coupling sleeve and modules together forming a closed, locked and sealed  
28 chamber in the mated position.

26. The connector as claimed in claim 25, wherein the outer surface of the  
2 second module has an indent and a snap lock member extends forwardly  
from the forward end face of the first module for snap lock engagement in the  
4 indent when the modules are pushed into mating engagement.

27. The connector as claimed in claim 25, wherein the coupling sleeve has  
2 a first indent at a spacing from its rear end, and the first module has first and  
second spaced retention members spaced rearwardly from the forward end of  
4 the first contact, the coupling sleeve moving relative to the first module as the  
modules are mated together between a first, unmated position in which the  
6 first retention member engages in the first indent to retain the coupling sleeve  
on the first module, and a second, mated position when the modules are  
8 mated together in which the second retention member engages in the first  
indent.

28. The connector as claimed in claim 27, wherein at least said first  
2 retention member comprises a seal member in sealing engagement with the  
inner surface of the coupling sleeve in said mated position in order to provide  
4 a seal at the rear end of the sealed cavity.

29. The connector as claimed in claim 27, wherein said one seal member  
2 comprises a first seal member on the first module and said first seal member  
is spaced from said second retention member in a direction towards the  
4 forward end of said coupling sleeve.

30. The connector as claimed in claim 29, wherein said retention members  
2 also comprise seal members when not engaged in said first indent.

31. The connector as claimed in claim 25, wherein the first module has a  
2 snap lock member and the second module has an indent for releasable snap  
engagement with said snap lock member when the modules are mated, the  
4 coupling sleeve having a second indent on its inner surface which is aligned  
with the snap lock member when the modules are separated, whereby the  
6 snap lock member is free to snap over the forward end of the second module  
and into the indent on the second module as the parts are mated, the second  
8 indent moving out of alignment with the snap lock member when the coupling

10 sleeve moves into the second, mated position, whereby the snap lock member is locked in the indent on the second module by the coupling sleeve to hold the modules together.

32. The connector as claimed in claim 25, wherein the first module has a plurality of first contacts seated therein and the second module has a plurality of second contacts seated therein equal in number to the number of first contacts, each first contact being in engagement with a corresponding second contact in the mated position.

33. A cable assembly, comprising:  
2 an elongate cable having a first end and a second end and at least one circuit extending through said cable;  
4 a first connector half secured to the first end of the cable;  
a second connector half secured to the second end of the cable;  
6 each connector half containing a contact communicating with said circuit, and comprising one half of a releasably mateable connector; and  
8 an outer, fluid-filled hose extending over said cable and having a first end sealed to the first connector half and a second end sealed to the second  
10 connector half.

34. The assembly as claimed in claim 33, wherein the hose has a central, collapsible section for allowing the hose to be collapsed axially to expose the cable ends for assembly of the fiber into the connector halves.

35. The assembly as claimed in claim 34, wherein the collapsible section comprises an accordion-like structure.

36. The assembly as claimed in claim 34, wherein the hose is formed in three separate parts, comprising a first hose portion extending from the first connector half, a second hose portion extending from the second connector



4 half, and said collapsible section connecting said first and second hose  
portions.

37. The assembly as claimed in claim 33, wherein a coupling sleeve is  
2 slidably mounted on the first connector half for releasably securing the first  
connector half to a second connector half on another cable in a mated  
4 position, the coupling sleeve having a forward end, a rear end, and a first  
through bore, the forward end of the coupling sleeve being spaced forwardly  
6 from the forward end of the first connector half and slidably receiving the  
forward end of a second connector half in the mated position, a first contact  
8 seated in the forward end of the first connector half, a second contact  
mounted in said second connector half for communication with the  
10 corresponding contact in a mating connector half when the connector halves  
are mated together, the circuit extending through the connector halves and  
12 having opposite ends comprising said contacts, the connector halves and  
coupling sleeve together forming a closed, locked and sealed chamber in a  
14 mated position, and the connector halves and coupling sleeve being relatively  
movable in a single axial mating motion between an unmated position and the  
16 mated position, and being movable relative to one another in a single axial  
unmating motion opposite to the mating motion to release the connector  
18 halves from one another.

38. A dry mate connector, comprising:  
2 a first module having a forward end and a rear end;  
a second module having a forward end and a rear end;  
4 a coupling sleeve mounted on the first module for releasably securing  
the modules together in a mated position, the coupling sleeve having a  
6 forward end spaced forwardly from the forward end of the first module for  
receiving the forward end of the second module in the mated position, a rear  
8 end, and a first through bore defining a contact chamber;

the modules each having at least one forwardly facing contact for  
10 communication with the contact of the other module within the contact  
chamber of the coupling sleeve in the mated position;  
12 at least one seal member located between each module and the  
through bore of said coupling sleeve in the mated position to seal opposite  
14 ends of said contact chamber; and  
a releasable locking mechanism for locking the modules together in the  
16 mated position, relative movement between the modules and coupling sleeve  
in a single, axial mating direction achieving mating and locking of said  
18 modules together, and relative movement between the modules and sleeve in  
a single, axial unmating direction opposite to said mating direction releasing  
20 said locking mechanism and allowing separation of said modules.

39. The connector as claimed in claim 38, wherein the modules have  
2 interengageable locking formations which are in releasable, locking  
engagement to secure the modules together in the mated position.

40. The connector as claimed in claim 39, wherein the coupling sleeve is  
2 movable on the first module between a first locking position when the  
modules are unmated and a second locking position when the modules are  
4 mated, the coupling sleeve having an inner surface and the modules having  
outer surface portions facing said inner surface in the mated position, one of  
6 the opposing inner and outer surfaces of the coupling sleeve and first module  
having a locking indent and the other of said surfaces having a pair of spaced  
8 locking members for releasable locking engagement in said locking indent in  
the first and second locking positions, respectively.

41. The connector as claimed in claim 40, wherein at least said locking  
2 member engaging said locking indent in said first locking position comprises a  
seal member for sealing engagement between said coupling sleeve and first  
4 module when not engaged in said locking indent.

42. The connector as claimed in claim 40, wherein the coupling sleeve  
6 holds the interengageable formations of the modules in locking engagement  
when in the second locking position.

43. The connector as claimed in claim 40, wherein spaced first, second,  
2 and third seal members are provided for sealing engagement between the  
coupling sleeve and first module, the first seal member engaging in said  
4 locking indent in the first locking position of said coupling sleeve and the  
second seal member engaging in said locking indent in the second locking  
6 position of said coupling sleeve, whereby the first and third seal members  
comprise two spaced seal members between the first module and coupling  
8 sleeve in the second locking position.

44. The connector as claimed in claim 43, wherein said locking indent is  
2 located on the inner surface of said coupling sleeve and said seal members  
comprise spaced O-ring seals mounted on the outer surface of said first  
4 module.

45. The connector as claimed in claim 38, wherein two spaced seal  
2 members are located between each module and the through bore of said  
coupling sleeve in the mated position to provide a double seal at each end of  
4 said contact chamber.

46. The connector as claimed in claim 45, wherein said seal members  
2 comprise O-ring seals.

47. The connector as claimed in claim 39, wherein the first module has a  
2 plurality of resilient locking tines extending forwardly from its forward end, the  
tines having enlarged end portions, and the second module has an annular  
4 locking indent on its outer surface for releasable snap engagement with the

6 enlarged end portions of the tines when the modules are moved into mating engagement.

2 48. The connector as claimed in claim 47, wherein said coupling sleeve  
4 has a detent aligned with said enlarged end portions when said coupling  
6 sleeve is in said first locking position, whereby said tines can flex over the  
8 outer surface of said second module when said second module is pushed into  
said coupling sleeve, and said detent is moved away from said enlarged end  
portions of said tines in said second locking position, whereby the inner  
surface of said coupling sleeve holds said enlarged end portions of said tines  
in said detent when said plug and receptacle modules are in mating  
engagement.

2 49. The connector as claimed in claim 38, wherein each of said modules  
has a plurality of contacts for engagement with corresponding, aligned  
contacts in the other module in said mated position.

2 50. The connector as claimed in claim 38, wherein said seal members  
comprise O-ring seals.

2 51. The connector as claimed in claim 38, wherein the contacts comprise  
co-axial cable wire ends, and the connector comprises a co-axial electrical  
cable connector.